contain the various articles that are in general use in the laboratory, such as corks, cork-borers, elastic tubing, holders of different kinds, glass tubes and rods, &c. Every drawer is labelled on a simple plan that I find very convenient.

A bit of zinc is bent at an angle of 45°. The two edges of the one half are then just turned over, and the whole is screwed to the front of the drawer. A card slipped under the turned-down edges is held perfectly tight, and can be removed at any time. Labels so arranged are much more easily seen than if they were simply fastened to the face of the drawers. (One is shown in the figure.)

The lower shelves above the drawers contain all the dry chemicals required in Harcourt and Madan's "Practical Chemistry" (the book we chiefly use in the laboratory), together with the more costly re-agents, and others that are in less frequent use. Each boy has a complete set of all the ordinary acids and test solutions on the shelves of his compartment.

The contents of the drawers and shelves on either side of the fire-place are arranged in duplicate—a complete set on each side. In this way all chance of confusion and crowding is avoided, as no boy can have occasion to cross over from the side of the room on which he is working to the opposite side, everything being ready to his hand.

A common balance with sets of gramme weights is placed on the table above each nest of drawers. Here also are kept the various measuring flasks and cylinders. At the other end of the room is an ordinary six-feet kitchen range, which has been slightly modified so as to serve for a furnace. It has sand-bath, boiler, and drying-oven. On one side of the furnace is a cupboard to contain a stock of glass and porcelain apparatus. On the other side are two spacious evaporating closets with sliding glass doors. These are supplied with hoods and jets for creating a powerful draught. The draught can be still further increased, when necessary, by lighting a large ring of jets in the flue communicating with the closets.

A small cupboard for tools and a glass-blower's table complete the furniture of the laboratory.

The room marked B, in the ground plan, was formerly the only laboratory for the use of the school. It was built some years ago, at the same time as the Natural Science lecture-room, and, though small, was exceedingly well arranged. It is now converted into a private laboratory for the use of the chemical lecturer. It contains a large evaporating closet, also a sand-bath and distilling apparatus, both of which are worked by the fire in the school laboratory by means of appropriate dampers. Here also is the flue for obtaining a down-draught at the lecture-table in the adjoining chemical lecture theatre. As several pipes open into this flue it was found necessary to place the large ring of gas-jets for creating the draught at a considerable elevation above the floor. To light this ring an artifice was employed that it may be worth while to mention. A supplementary gas-pipe was carried alongside of the supply-pipe from a few feet above the floor to the ring of jets. This was pierced with small jets at short intervals all the way to the top. A separate tap turns on the gas in this pipe, and upon applying a light to the lowest jet the flame runs rapidly up the pipe and lights the ring at the top. The gas is then turned off from the supplementary pipe and the ring alone left burning.

From the private laboratory a door opens into the chemical lecture-room. This is provided with seats for fifty boys, the forms and desks rising tier above tier so that experiments at the lecture table are well seen by all. The down draught at the lecture table, already alluded to, is most useful. Experiments with chlorine may be performed with hardly any smell escaping.

The theatre is well supplied with shelves, cupboards, apparatus cases, diagram-screens, and black-board. There is also a capital cellar for stock chemicals, batteries and empty cases.

The Physical Science lecture theatre, D, is of still larger dimensions, and will hold sixty boys. A space at one end is fitted up with work-tables, &c., where experiments may be prepared, and also where boys may themselves learn how to use physical apparatus under the eye of a master.

The walls of the room, E, are entirely lined with glass cases for the reception of the school apparatus. Here, also, is a lathe with table-vice and bench, where an assistant, accustomed to mechanical work, can make various lecture illustrations, and repair instruments that are out of order.

I ought to add that the Natural Science Schools are only part of an extensive block of new buildings containing several classical and other schools, and that the whole has been erected from the designs of Mr. W. Butterfield.

T. N. HUTCHINSON

NOTES

M. DELAUNAY is the new director of the Paris Observatory. We must congratulate the French Government upon their appointment. M. Delaunay, who has just received the Medal of our Royal Astronomical Society for his researches on the moon's motion, is an astronomer second to none, and is in every way admirably qualified for such an important post.

AT the Royal Society's Soirée on Saturday last, a number of interesting objects were exhibited, among which we may mention Mr. Roberts's specimens of electro-deposited iron; Mr. Siemens specimens of cast steel from the Landore-Siemens Works; a chronoscope of elaborate construction, exhibited by Capt. Noble, for recording at one observation the velocity with which a projectile passes different parts of the bore of a gun. The principle of this instrument is that of registering, by means of electric currents, upon a recording surface, travelling at a uniform and very high speed, the precise instant at which a shot passes certain defined points in the bore. It is capable of indicating intervals of time as minute as one-millionth part of a second. We shall again refer to some of the objects exhibited.

AT the meeting of the Royal Society last week, the names of the candidates for election, fifty-three in number, were read. From these, in accordance with the usual practice, fifteen will be chosen to be elected by the Fellows of the Society in June next. Last year the number of candidates was forty-five.

AT the same meeting two short papers were read from Mr. Le Sueur, who has charge of the great telescope at Melbourne, giving an account of his observations of some of the nebulæ included in Sir John Herschel's Cape Catalogue. The details are interesting, and full of promise for the future; as are also the particulars of spectroscopic observations of Jupiter which accompany the observations of nebulæ.

THE *Athenæum*, in reporting that Mr. Hind has issued a circular showing the path of the moon's shadow in the eclipse of the sun which will take place on the 22nd December, remarks that it is to be hoped that our Government will send out an expedition thoroughly equipped with spectroscopes to settle the nature of the corona, one of the last remaining questions of solar physics.

IT is satisfactory to know that the Municipal authorities of Glasgow are alive to the prospective benefits which their city is likely to gain, in a sanitary point of view, from the investigations which are to be instituted by the Sewage Committee of the British Association. If any city more than another needs the sanitarian besom it must surely be Glasgow, when it is remembered that it enjoys the unenviable notoriety of having the highest death-rate of all the great towns of the kingdom. Its desire to get this stigma removed is indicated by the fact that the Police Commissioners, at their last meeting, on the motion of a genuine sanitarian, the chairman of the Health Committee, voted the sum of 100*l.* towards defraying the expenses of the British Association Committee referred to above. We understand that the fund already amounts to upwards of 1,000*l.*

The Swiney Lectures on Geology are to be delivered at the London Institution, by Dr. Cobbold, F.R.S., commencing on March 10th. During the course it is proposed to discuss, among other subjects, "The scope and tendency of the physical and biological sciences," "The best modes of acquiring adequate conceptions of geologic time," "Evidences of the incompleteness of the geological record," and "The claims of geology as an aid to the acquirement of high mental culture."

On the 13th of January died F. T. Otto, Professor at the Polytechnic School of Brunswick, known chiefly as the translator of Graham's "Elements of Chemistry." Two editions of this translation having been rapidly sold, a third edition was commenced in 1852, in which the plan of the original was entirely changed. Otto treated mineral chemistry in three volumes; theoretical chemistry being reserved to Buff, Kopp and Zamminer, and organic chemistry to Kolbe and Fehling. Otto's chemical researches were not considerable. His books, however on the manufacture of vinegar and on agricultural industry are held in great esteem. Otto was born in Saxony in 1809.

The paper to be read on Thursday at the Royal Society, by Mr. Warren de la Rue, Dr. Balfour Stewart, and Mr. Loewy, is expected to be of great interest.

Professor Unger, of Vienna, a well-known botanist, whose death we reported last week, was, it is now stated, found murdered in his bed at Graz; and no trace of the murderer has as yet been discovered. A priest has taken this opportunity to assert from the pulpit at Cilly, Styria, that the body of the late philosopher had probably been destroyed by the devil himself, who had just claims upon his soul!

We learn from the *Society of Arts Journal* that a Hygienic Council, attached to the Turkish Ministry of the Interior, has been created, with the function of improving the drainage, enforcing proper street scavengering and public cleanliness, both in the capital and throughout the provinces. Its further duty will be to improve existing civilian hospitals, and establish new ones where needed.

The examination of candidates for the Royal Agricultural Society's prizes will take place in the week commencing 26th April.

The Royal Asiatic Society offer to treat with any learned Society for the use of rooms in their new premises in Albemarle Street, which are more than they require.

The *Photographic News* announces the death of Mr. Bingham, an English photographer long resident in Paris, and at one time assistant to Faraday.

There is a talk of an International Congress of Geographers at Antwerp. Many eminent French *savants* have promised to take part.

Mr. Alglave reports in the *Revue des Cours Scientifiques* that the Sars Fund now amounts to about 260*l.*

We acknowledge the receipt of the ninth number of the *Free Sunday Advocate*, with a supplement, containing Professor Huxley's lecture "On the forefathers and forerunners of the English people"—a paper by Wm. Duthie, Esq., "On the social economy of Sunday, stating reasons for the opening of picture galleries, museums, and gardens, and running railway trains and steamboats on Sunday"—also the first of Dr. Carpenter's lectures "On the physical conditions and animal life of the deep sea."

Cosmos complains that the approaching réunion at the Sorbonne instead of being an assemblage of philosophers is to be merely a gathering of students, to compete for and receive prizes.

We acknowledge the receipt of the Meteorological Tables for the Quarter ending 31st December last by Mr. Glaisher.

The *Revue des Cours Scientifiques* states that the botanical collection formed by Baron Delessert, and since maintained by his son, who died lately, has been left to the town of Geneva. The library has been deposited in the Academy of Sciences.

With reference to Prof. Stanley Jevons's paper, read last month at the Royal Society, on the representation of logical processes by mechanism, it seems right to mention that Mr. Alfred Smee, F.R.S., published a book twenty years ago on the "Progress of Thought," in which engravings were given of a machine for the representation of mental operations. At present it is difficult to see what would be the utility of such machines; but if they are to be regarded as a step towards one that will some day be really useful, then the invention may be accepted as something more than an ingenious curiosity.

In the report of the Royal Commission on Pollution of Rivers, the presence of arsenic in the water and mud of rivers near alkali works is pointed out, and it is also stated that the London sewage at Barking contains as much as ·004 of arsenic in 100,000 parts.

The *Levant Herald* states that the Turkish Government is about to adopt the French Metric System. It is to be gradually brought into use. The oke very nearly corresponds to the kilogramme.

The second of a course of weekly lectures on subjects connected with Economic Science, especially as concerned with labour and capital, under the auspices of the Social Science Association, was delivered inthe house of the Society of Arts, John Street, Adelphi, on Tuesday evening, by Frederick Hill, Esq., on "The Identity of the Interests of Employers and Work-people." The chair taken by George Godwin, Esq.

The Council of the Society of Arts will consider the award of the Albert medal early in May next.

An injunction has been granted to restrain the Corporation of Leeds from discharging sewage into the river Aire.

The first Exhibition of Spring Flowers at the Gardens of the Royal Botanic Society, is to take place on the 30th and 31st of this month.

At a Session of the Council of University College, London, on Saturday last, Mr. George Grote, president, in the chair, Mr. Henry Maudsley, M.D. Lond., Fellow of the College, was appointed Professor of Medical Jurisprudence. A Whitworth Exhibition of 25*l.* was awarded to Mr. Robert Forsyth Scott, a student of the college.

The new chemical laboratory erected for the use of the scholars at Eton College has just been opened for school purposes, under the superintendence of Mr. Madan. There are two large rooms, one of which will be used for lectures and the other for school purposes.

From a circular lately issued to the Government science teachers, we learn that the Lord President and the Vice-President of the Committee of Council on Education have found it advisable to modify the provisions of the Council's minute of the 30th November, 1869, in reference to the mode of paying those teachers for their arduous work of instructing the industrial classes in elementary science. Since the teachers held their meeting at Manchester, the complaint which they brought against the Science and Art Department of breach of faith, and repudiation of engagements made with them, has been pressed upon the Government by a strong force of Lancashire and Yorkshire members of Parliament.

THE *British Medical Journal* states that Prof. Agassiz is ill from nervous prostration and over-work, not being able even to write letters.

THE Gulstonian Lectures for this year will be delivered at the Royal College of Physicians, by Dr. Maudsley, on the 11th, 16th, and 18th of this month, the subject being "The Relations between Body and Mind, and between Mental and other Nervous Disorders." The Croonian Lectures will be on "Aneurism of the Heart," and will be delivered by Dr. Gibson on the 23rd, 25th, and 30th of March. The subject of the Lumleian Lectures on the 1st, 6th, and 8th of April, will be "The Natural History and Diagnosis of Intra-Thoracic Cancer," by Dr. J. R. Bennett. The lectures will commence in each case at 5 o'clock.

THE Acclimatation Society of Paris has awarded to Mr. P. L. Simmonds its silver medal, of the first class, for his paper on "Silk cultivation and supply," read before the Indian Conference of this Society last year. A similar medal has been awarded to Mr. G. W. Hart, of Hayling Island, for his labours in oyster culture.

THE Instituto Tecnico of Palermo has published another part of the *Giornale di Scienze Naturali ed Economiche*, which well sustains the character of the work. Among the papers therein contained we notice—"Avifauna del Modenese e della Sicilia," "Sui materiali per costruzione di mattoni refrattarii per le zolfare," "Nuove specie di funghi," "Determinazione del luogo chimico nelle sostanze aromatache," and "Studii palæontologici sulla fauna del calcario a telebratula janitor del nord di Sicilia." Besides all this, the part contains eight numbers of the *Bulletino* of the Royal Astronomical Observatory at Palermo, in which are records of observations astronomical and meteorological, notices of sun-spots and magnetic perturbations, and on shooting-stars and meteors, with lithographic illustrations. It is gratifying to find that even in Sicily science is making progress.

THE Government of India has lately sanctioned the commencement of the Damoodah Canal, at an estimated cost of about 540,000*l.* Its total length will be just 100 miles. One end of it will terminate in the heart of the Bengal coal-fields, and it will thus be the means of affording a cheap line of transport for carrying coals into Calcutta, relieving at the same time the railway of a portion of that traffic. A secondary but very important result of this canal is likely to be the drainage of the tract of land lying between the railway and the Damoodah, which for the last seven years has been desolated by malarious fever.

WE learn that the success of the Lectures for Women during the present term has equalled the most sanguine expectations of the originators of the scheme. Between seventy and eighty ladies are now attending eight courses of lectures, the number of attendances (counting each lecture separately) being in all 115. The committee proposes to issue in June a complete programme of the lectures for the next academical year. The present courses will be continued during the next (Easter) term at the present hours, unless special notice of a change be given.

WE have received from the Hydrographic Office of the Admiralty a copy of the notice to mariners stating that, on or about the 1st of April next, a telegraphic station vessel will be moored by the International Mid-Channel Telegraph Company off the entrance to the English Channel, in from fifty-five to fifty-nine fathoms water, in lat. 49° 20′ 30″ N., long. 6° 17′ W. of Greenwich. The vessel will be painted black, with the words "Telegraph Ship" in white letters on her sides; she will have three masts. At the top of the mainmast a large black cone will be hoisted during daytime, and a powerful globular light at night, elevated thirty feet above the sea, which in clear weather should be seen from a distance of six miles. A flare-up light will also be shown every fifteen minutes during the night, from an hour after sunset to an hour before sunrise. During foggy weather, day or night, a bell will be rung continuously for half a minute every quarter of an hour; and for the first six months, or until the 1st day of October 1870, a gun will be fired every quarter of an hour, and after that date every hour. The commercial code of signals for the use of all nations will be used on board, to the exclusion of all other codes, and none other can be noticed. In reference to this, M. Delehaye remarks in the *Bulletin* of the Association Scientifique of France that it will be of great service to navigation by saving time, and obviating risk and expense. For meteorological purposes also he believes this station will be very useful. He might have extended his list.

ON THE TEMPERATURE AND ANIMAL LIFE OF THE DEEP SEA[*]

I.

THE present discourse embodies the most important general results obtained by the exploration of the deep sea in the neighbourhood of the British Isles, carried on during the summer of 1869 in H.M. surveying vessel *Porcupine*, with the view of completing and extending the inquiries commenced in the *Lightning* expedition of 1868, of which an account was given by the speaker at the Friday evening meeting of April 9, 1869.[†]

The expedition of the *Porcupine* was divided into three cruises. The first of these, which was placed under the scientific charge of Mr. J. Gwyn Jeffreys, F.R.S., accompanied by Mr. William L. Carpenter, as chemical assistant, commenced from Galway near the end of May, and concluded at Belfast at the beginning of July. It was directed in the first instance to the south-west, then to the west, and finally to the north-west as far as the Rockall Bank. The greatest depth at which temperature-sounding and dredging were carried on in this cruise was 1,476 fathoms; and these operations, through the excellent equipment of the *Porcupine* and the skill of her commander, Captain Calver, were so successfully performed, that it was confidently anticipated that still greater depths might be reached with an equally satisfactory result.

The second cruise, which was under the scientific charge of Prof. Wyville Thomson, F.R.S., with Mr. Hunter as chemical assistant, was consequently directed to the nearest point at which a depth of 2,500 fathoms was known to exist, viz., the northern extremity of the Bay of Biscay, about 250 miles to the west of Ushant. In this cruise temperature-sounding and dredging were carried down to the extraordinary depth of 2,345 fathoms, or nearly three miles—a depth nearly equal to the height of Mont Blanc, and exceeding by more than 500 fathoms that from which the Atlantic Cable was recovered. This sea-bed, on which the pressure of the superincumbent water is nearly three tons for every square inch, was found to support an abundance of animal life; about 1½ cwt. of "Atlantic mud," chiefly consisting of *Globigerinæ*, having been brought up in the dredge, together with various types of higher animals, Echinoderms, Annelids, Crustaceans, and Mollusks; among them a new Crinoid—referable, like the *Rhizocrinus*, whose discovery by M. Sars, jun., had been the starting-point of the present inquiry—to the *Apiocrinite* type which flourished during the Oolitic period.

The third cruise was under the scientific charge of the speaker, with Mr. P. H. Carpenter as chemical assistant; but he had the great advantage of being accompanied by his colleague Prof. Wyville Thomson, who, as in the *Lightning* expedition, took the entire superintendence of the dredging operations. The object of this cruise, which commenced in the middle of August and terminated in the middle of September, was a more thorough exploration of the area between the North of Scotland and the Faroe Islands, which had been found in the *Lightning* expedition to afford results of peculiar interest in regard alike to the inequality of temperature and to the distribution of animal life on the sea-bed, which here ranges between the comparatively shal-

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[*] A Lecture delivered at the Royal Institution.

[†] Proceedings of the Royal Institution, vol. v. p. 503.